Nursing Management of the Burn-Injured Person

8

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8.1 Introduction

The repertoire of skills needed to provide care to the burn-injured patient includes comprehensive clinical assessment and monitoring, pain management, wound care and psychosocial support. This chapter is focused on providing the nurse with valuable information for the provision of appropriate nursing care.

8.2 Knowledge Base

8.2.1 General Definition and Description

8.2.1.1 Incidence

- Annually, an estimated 450,000 people seek care for burns in the USA [1, 2].
- Approximately 45,000 require hospitalisation, greater than half of whom (25,000) receive care in specialised burn units or centres [1, 2].
- Survival rate, for hospitalised patients, is around 96 %.
- Children 4 years of age and younger and adults over the age of 55 form the largest group of fatalities.
- In North America and Europe, 70 % of burn survivors are male and 30 % female.

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Table 8.1 American Burn Association adult burn classification

Classification	Assessment criteria
Minor burn injury	<15 % TBSA burn in adults <40 years age
	<10 % TBSA burn in adults >40 years age
	<2 % TBSA full-thickness burn without risk of functional or aesthetic impairment or disability
Moderate uncomplicated burn injury	15–25 % TBSA burn in adults <40 years age
	10–20 % TBSA burn in adults >40 years age
	<10 % TBSA full-thickness burn without functional or aesthetic risk to burns involving the face, eyes, ears, hands, feet or perineum
Major burn injury	>25 % TBSA burn in adults <40 years age
	>20 % TBSA burn in adults >40 years age
	OR >10 % TBSA full-thickness burn (any age)
	OR injuries involving the face, eyes, ears, hands, feet
	OR perineum likely to result in functional or aesthetic disability
	OR high-voltage electrical burn
	OR all burns with inhalation injury or major trauma

8.2.1.2 Classification

Burn complexity can range from a relatively minor, uncomplicated injury to a life-threatening, multisystem trauma. The American Burn Association (ABA) has a useful classification system that rates burn injury magnitude from minor to moderate, uncomplicated to major (Table 8.1).

8.3 Aetiology and Risk Factors

The causes of burn injuries are numerous and found in both the home, leisure and workplace settings (Table 8.2).

8.3.1 Pathophysiology

8.3.1.1 Severity Factors

There are five factors that need to be considered when determining the severity of a burn injury (Box 8.1):

1. *Extent* – There are several methods available to accurately calculate the percentage of body surface area involved:
   - The simplest is the rule of nines (see Chap. 1, Fig. 1.1 and Chap. 2, Fig. 2.2). *However, it is only for use with the adult burn population.*
   - The Lund and Browder method (see Chap. 1, Fig. 1.1 and Chap. 2, Fig. 2.2) is useful for all age groups, but is more complicated to use.
   - There is a paediatric version of the Lund and Browder method (see Chap. 2, Fig. 2.2).

Table 8.2 Causes of burn injuries

Home and leisure	Workplace
Hot water heaters set too high (140 °F or 60 °C)	Electricity:
Overloaded electrical outlets	Power lines
Frayed electrical wiring	Outlet boxes
Carelessness with cigarettes, lighters, matches, candles	Chemicals:
Pressure cookers	Acids
Microwaved foods and liquids	Alkalis
Hot grease or cooking liquids	Tar
Open space heaters	Hot steam sources:
Gas fireplace doors	Boilers
Radiators	Pipes
Hot sauna rocks	Industrial cookers
Improper use of flammable liquids:	Hot industrial presses
Starter fluids	Flammable liquids:
Gasoline	Propane
Kerosene	Acetylene
Electrical storms	Natural gas
Overexposure to sun	

Box 8.1. Burn Severity Factors

1. Extent of body surface area burned
2. Depth of tissue damage
3. Age of person
4. Part of body burned
5. Past medical history

- If the burned areas are scattered, small and irregularly shaped, the rule of palm can be used. The palm of the burned person's hand represents 1 % body surface area.
- If 10 % or more of the body surface of a child or 15 % or more of that of an adult is burned, the injury is considered serious. The person requires hospitalisation and fluid replacement to prevent shock.

2. Depth
   - Two factors determine the depth of a burn wound: temperature of the burning agent and duration of exposure time.
   - Previous terminology to describe burn depth was first, second and third degree. In recent years, these terms have been replaced by those more descriptive in nature: superficial partial-thickness, deep partial-thickness and full-thickness (Table 8.3).
   - Superficial burns, such as those produced by sunburn, are not taken into consideration when assessing extent and depth.

Table 8.3 Classification of burn injury depth

Degree of burn	Cause of injury	Depth of injury	Appearance	Treatment
First degree	Superficial sunburn Brief exposure to hot liquids or heat flash	Superficial damage to epithelium Tactile and pain sensations intact	Erythematous, blanching on pressure, no blisters	Complete healing within 3–5 days with no scarring
Superficial partial-thickness (second degree)	Brief exposure to flame, flash or hot liquids	Destruction of epidermis, superficial damage to upper layer of dermis, epidermal appendages intact	Moist, weepy, blanching on pressure, blisters, pink or red colour	Complete healing within 14–21 days with no scarring
Deep partial-thickness (deep second degree)	Exposure to flame, scalding liquids or hot tar	Destruction of epidermis, damage to dermis, some epidermal appendages intact	Pale and less moist, no blanching or prolonged, deep pressure sensation intact, pinprick sensation absent	Prolonged healing time usually >21 days with scarring. Skin grafting may be necessary for improved functional and aesthetic outcome
Full-thickness (third degree)	Prolonged contact with flame, steam, scalding liquids, hot objects, chemicals or electrical current	Complete destruction of epidermis, dermis and epidermal appendages; injury through most of the dermis	Dry, leathery, pale, mottled brown or red in colour; visible thrombosed vessels insensitive to pain and pressure	Requires skin grafting
Full-thickness (fourth degree)	Major electrical current, prolonged contact with heat source (i.e. unconscious patient)	Complete destruction of epidermis, dermis and epidermal appendages; injury involving connective tissue, muscle and bone	Dry, black, mottled brown, white or red; no sensation and limited movement of burned limbs or digits	Requires skin grafting and likely amputation

- The skin is divided into three layers, which include the epidermis, dermis and subcutaneous tissue (Fig. 8.1).

3. Age
   - For patients less than 2 years of age and greater than 50, there is a higher incidence of morbidity and mortality.
   - Sadly, the infant, toddler and elderly are at increased risk for abuse by burning.
4. Part of the body burned
   - Patients with burns to the face, neck, hands, feet or perineum have greater challenges to overcome and require the specialised care offered by a burn centre.
5. Past medical history
   - Pre-existing cardiovascular, pulmonary or renal disease will be exacerbated by the burn injury.
   - Persons with diabetes or peripheral vascular disease have a more difficult time with wound healing, especially on the legs and feet.

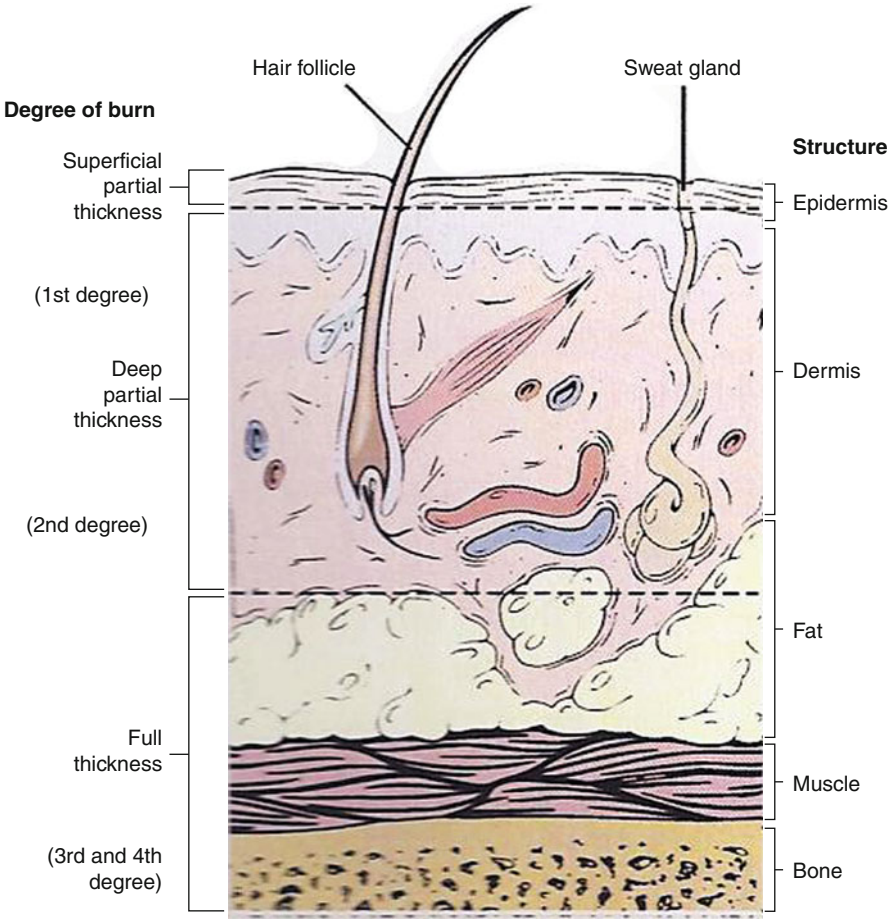

Fig. 8.1 Anatomy of burn tissue depth

8.3.2 Local Damage

Local damage varies, depending upon:
(a) Temperature of the burning agent
(b) Duration of contact time
(c) Type of tissue involved
Zones of tissue damage:
- Inner zone of *coagulation* (full-thickness injury) – irreversible cell death, skin grafting needed for permanent coverage
- Middle zone of *stasis* (deep, partial-thickness injury) – some skin-reproducing cells present in the dermal appendages with circulation partially intact, healing generally within 14–21 days
- Outer zone of *hyperaemia* (superficial, partial-thickness injury) – minimal cell involvement and spontaneous healing within 7–10 days

8.3.3 Fluid and Electrolyte Shifts

The immediate post-burn period is marked by dramatic circulation changes, producing what is known as "burn shock" (Fig. 8.2).
- As the capillary walls begin leaking, water, sodium and plasma proteins (primarily albumin) move into the interstitial spaces in a phenomenon known as "second spacing".
- When the fluid begins to accumulate in areas where there is normally minimal to no fluid, the term "third spacing" is used. This fluid is found in exudate and blisters.
- There is also insensible fluid loss through evaporation from large, open body surfaces. A non-burned individual loses about 30–50 mL/h. A severely burned patient may lose anywhere from 200 to 400 mL/h.
- Circulation is also impaired in the burn patient due to haemolysis of red blood cells.
- Following successful completion of the fluid resuscitation phase, capillary membrane permeability is restored. Fluids gradually shift back from the interstitial space to the intravascular space, and the patient is no longer grossly oedematous and diuresis is ongoing.

8.4 Cardiovascular, Gastrointestinal and Renal System Manifestations

During the hypovolemic shock phase, only vital areas of circulation are maintained.
- Cardiac monitoring is essential, particularly if the patient has a pre-burn history of cardiac problems.
- Electrical burn patients, who arrest at the scene or who experience cardiac arrhythmias post-injury, warrant particular vigilance.

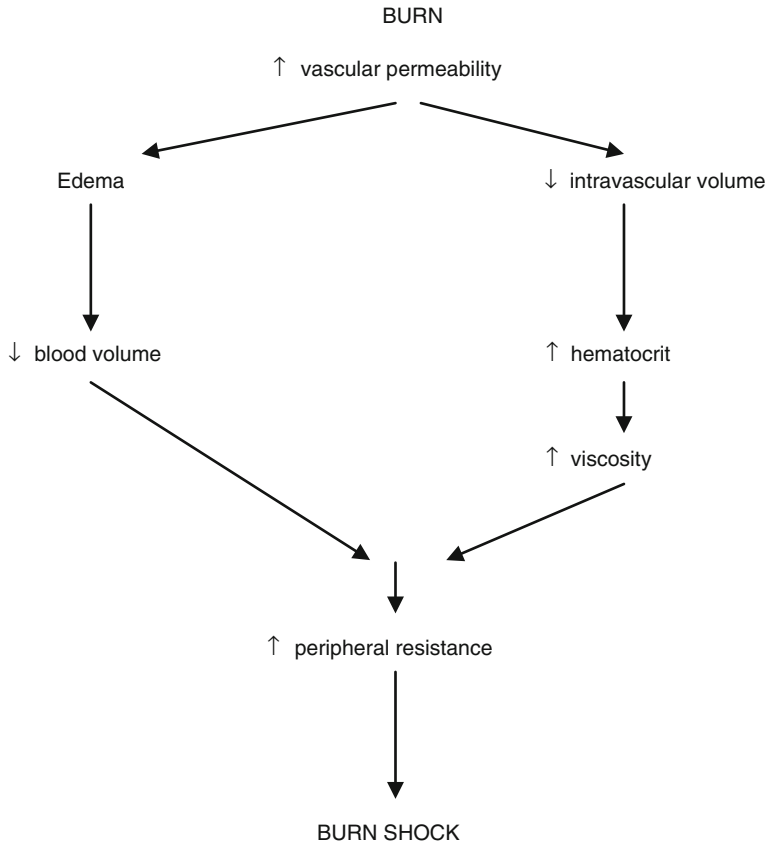

Fig. 8.2 Burn shock

- Hypovolemic shock and hypoxemia also produce the initial gastrointestinal complications seen post-burn, such as decreased peristalsis and abdominal paralytic ileus.
- Stress response post-burn releases catecholamines and may produce stress (Curling's) ulcers in burns >50 % body surface area.
- Renal complications are predominantly caused by hypovolemia. If perfusion remains poor, high circulating levels of haemoglobin and myoglobin may clog the renal tubules, causing acute tubular necrosis.

8.4.1 Types of Burn Injuries

- *Thermal* (Table 8.4)
  - Dry heat, such as flame and flash
  - Moist heat, such as steam and hot liquids
  - Direct contact, such as hot surfaces and objects

Table 8.4 Causes of thermal burns

Cause	Examples
Dry heat – flame	Clothing catches on fire Skin exposed to direct flame
Dry heat – flash	Flame burn associated with explosion (combustible fuels)
Moist heat – hot liquids (scalds)	Bath water Beverages – coffee, tea, soup Cooking liquids or grease
Moist heat – steam	Pressure cooker Microwaved food Overheated car radiator
Contact – hot surfaces	Oven burner and door Barbecue grill
Contact – hot objects	Tar Curling iron Cooking pots/pans

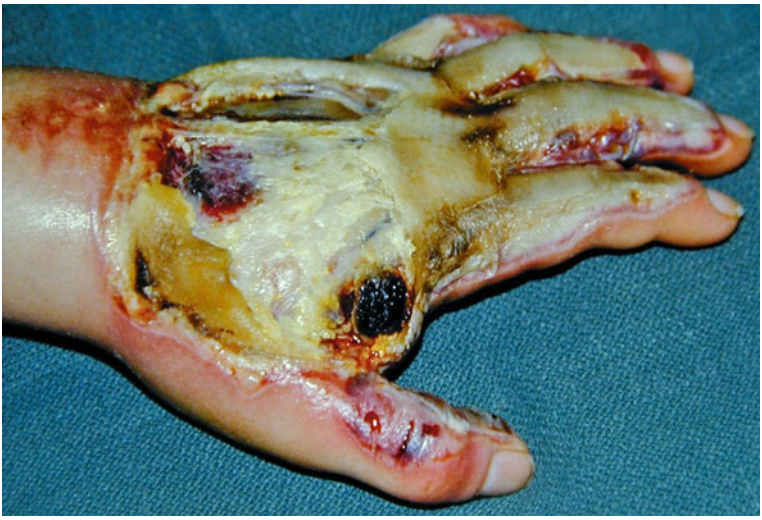

Fig. 8.3 Third degree/full-thickness flame burn

  - Major source of morbidity and mortality across all age groups (Figs. 8.3 and 8.4)
- *Chemical* (Fig. 8.5)
  - More than 25,000 chemicals worldwide
  - Divided into two major groups: acids and alkalis
  - Extent and depth injury: directly proportional to the amount, type and strength of the agent, its concentration, degree of penetration, mechanism of action and length of contact time with the skin
- *Electrical* (Fig. 8.6)
  - Comprise a small portion of the burn population.

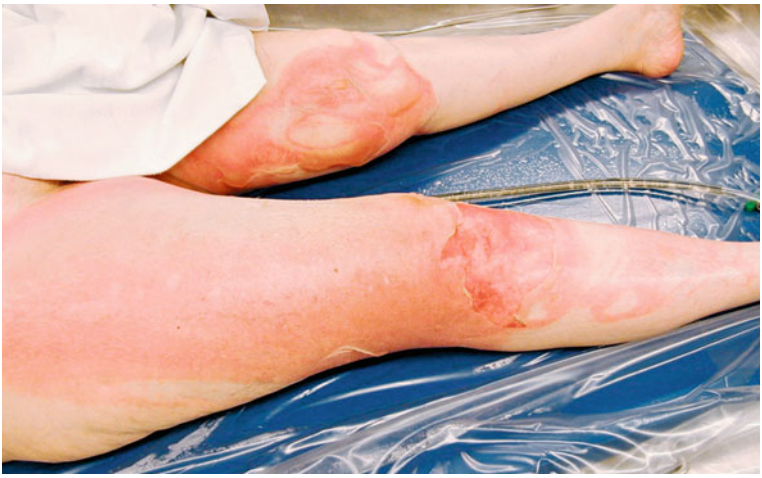

Fig. 8.4 Scald burn: looks can be deceiving – burn wound progression over several days

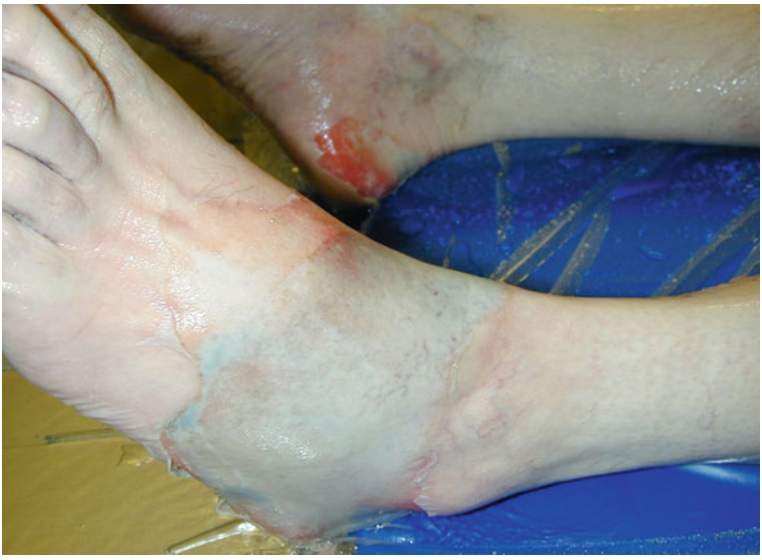

Fig. 8.5 Chemical burns: looks can be deceiving – copious flushing for up to several hours

- Outcomes can be devastating due to tissue damage and potential limb loss.
- Severity of injury difficult to determine as most of the damage may be below skin at level of muscle, fat and bone.
- Entry and exit points determine probable path of current and potential areas of injury.

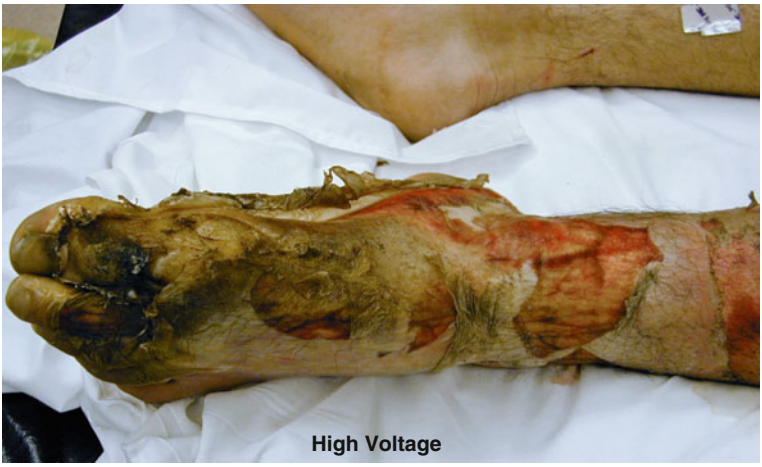

Fig. 8.6 Electrical burn

  - If person has fallen post-injury, protect head and cervical spine during transport; need to perform spinal x-rays and neurological assessment.
  - May continue to be at risk for cardiac arrhythmias for 24 h post-burn, so ECG needed on admission and at 24 h post-burn.
  - Infuse Lactated Ringer's solution at a rate that maintains a good urinary output between 75 and 100 mL/h until colour of urine sufficient to suggest adequate dilution of haemoglobin and myoglobin pigments.
  - Administer osmotic diuretic (e.g. mannitol) to establish and maintain acceptable urinary output.
- *Smoke and Inhalation Injury* (Fig. 8.7)
  - Exposure to smoke and inhalation of hot air, steam or noxious products of combustion.
  - Presence of inhalation injury, with a large burn, can double or triple one's mortality rate.
  - Signs and symptoms: burns to head and neck, singed nasal hairs, darkened oral and nasal membranes, carbonaceous sputum, stridor, hoarseness, difficulty swallowing, history of being burned in an enclosed space, exposure to flame, including clothing catching fire near the face, indoors and outdoors.
  - Critical period is 24–48 h post-burn.
  - Most fatalities at fire scene caused by carbon monoxide poisoning or asphyxiation (Table 8.5).
  - Treatment is 100 % humidified oxygen until carboxyhemoglobin falls to acceptable levels.
- *Radiation*
  - Overexposure to sun or radiant heat sources, such as tanning lamps or tanning beds.
  - Nuclear radiation burns require government intervention and specialised treatment.

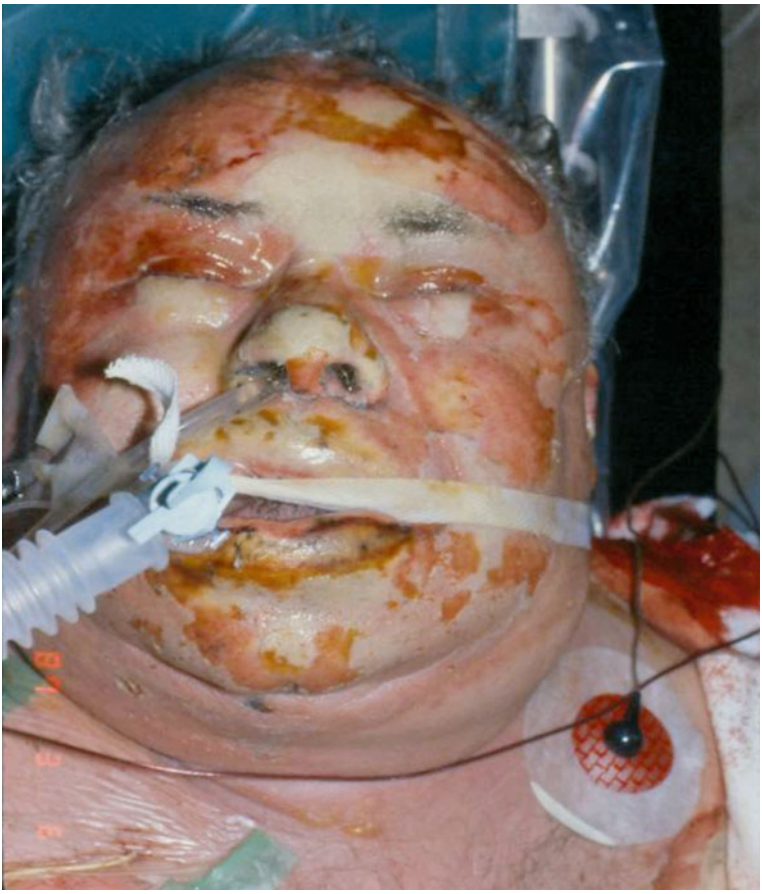

Fig. 8.7 Inhalation injury

Table 8.5 Signs and symptoms of carbon monoxide poisoning

Carboxyhemoglobin saturation (%)	Signs and symptoms
5–10	Visual acuity impairment
11–20	Flushing, headache
21–30	Nausea, impaired dexterity
31–40	Vomiting, dizziness, syncope
41–50	Tachypnea, tachycardia
>50	Coma, death

8.4.1.1 Clinical Manifestations

Care Priorities During the Emergent, Acute and Rehabilitative Periods

1. Principles of care for the *emergent* period: resolution of the immediate problems resulting from the burn injury. The time required for this to occur is usually 1–2 days. The emergent phase ends with the onset of spontaneous diuresis.

2. Principles of care for the *acute* period: avoidance, detection and treatment of complications and wound care. This second phase of care ends when the majority of burn wounds have healed.
3. Principles of care for the *rehabilitative* period: eventual return of the burn survivor to an acceptable place in society and completion of functional and cosmetic reconstruction. This phase ends when there is complete resolution of any outstanding clinical problems resulting from the burn injury.
   - Initial assessment of the burn patient is like that of any trauma patient and can best be remembered by the simple acronym "ABCDEF" (Box 8.2). During the *emergent period*, burn patients exhibit signs and symptoms of hypovolemic shock (Box 8.3). Lack of circulating fluid volumes will also result in minimal urinary output and absence of bowel sounds. The patient may also be shivering due to heat loss, pain and anxiety. With inhalation injury, the airway should be examined visually and then with a laryngoscope/bronchoscope (Box 8.4). The patient may also experience pain, as exhibited by facial grimacing, withdrawing and moaning when touched, particularly if the injuries are partial-thickness in nature. Some areas of full-thickness burn may be anaesthetic to pain and touch if the nerve endings have been destroyed. It is

Box 8.2. Primary Survey Assessment

A	➲	**A**irway
B	➲	**B**reathing
C	➲	**C**irculation **C**-spine immobilisation **C**ardiac status
D	➲	**D**isability Neurological **D**eficit
E	➲	**E**xpose and **e**valuate
F	➲	**F**luid resuscitation

Box 8.3. Signs and Symptoms of Hypovolemic Shock

- Restlessness, anxiety
- Skin – pale, cold, clammy
- Temperature below 37 °C
- Pulse is weak, rapid, ↓ systolic BP
- Urinary output <20 mL/h
- Urine specific gravity >1.025
- Thirst
- Haematocrit <35; BUN ↑

Box 8.4. Physical Findings of Inhalation Injury
- Carbonaceous sputum
- Facial burns, singed nasal hairs
- Agitation, tachypnoea, general signs of hypoxemia
- Signs of respiratory difficulty
- Hoarseness, brassy cough
- Rales, ronchi
- Erythema of oropharynx or nasopharynx

Box 8.5. Signs and Symptoms of Vascular Compromise
- Cyanosis
- Deep tissue pain
- Progressive paraesthesias
- Diminished or absent pulses
- Sensation of cold extremities

Box 8.6. Secondary Survey Assessment
- Head-to-toe examination
- Rule out associated injuries
- Pertinent history
  - Circumstances of injury
  - Medical history

important to examine areas of circumferential full-thickness burn for signs and symptoms of vascular compromise, particularly the extremities (Box 8.5). Areas of partial-thickness burn appear reddened, blistered and oedematous. Full-thickness burns may be dark red, brown, charred black or white in colour. The texture is tough and leathery, and no blisters are present. If the patient is confused, one has to determine if it is the result of hypovolemic shock, inhalation injury, substance abuse, pre-existing history or, more rarely, head injury sustained at the time of the trauma. It is essential to immobilise the c-spines until a full assessment can be performed and the c-spines cleared. At this time, a secondary survey assessment is performed (Box 8.6).

- In the *acute phase*, the focus is on *wound care* and *prevention/management of complications*. At this point, the burn wounds should have declared themselves as being partial-thickness or full-thickness in nature. Eschar on partial-thickness wounds is thinner, and, with dressing changes, it should be possible to see evidence of eschar separating from the viable wound bed.

Healthy, granulation tissue is apparent on the clean wound bed, and re-epithelialising cells are seen to migrate from the wound edges and the dermal bed to slowly close the wound within 10–14 days. Full-thickness wounds have a thicker, more leathery eschar, which does not separate easily from the viable wound bed. Those wounds require surgical excision and grafting. Continuous assessment of the patient's systemic response to the burn injury is an essential part of an individualised plan of care. Subtle changes quickly identified by the burn team can prevent complications from occurring or worsening over time.

- During the final, *rehabilitative phase*, attention turns to *scar maturation, contracture development and functional independence issues*. The areas of burn, which heal either by primary intention or skin grafting, initially appear red or pink and are flat. Layers of re-epithelialising cells continue to form, and collagen fibres in the lower scar tissue add strength to a fragile wound. Over the next month, the scars may become more red from increased blood supply and more raised from disorganised whorls of collagen and fibroblasts/myofibroblasts. The scars are referred to as hypertrophic in nature. If oppositional forces are not applied through splinting devices, exercises or stretching routines, this new tissue **c**ontinues to heal by shortening and forming contractures. A certain amount of contracture development is unavoidable, but the impact can be lessened through prompt and aggressive interventions.

8.5 Clinical Management

8.5.1 Nonsurgical Care

Emergent Phase Priorities: airway management, fluid therapy, initial wound care
Emergent Phase Goals of Care: initial assessment, management and stabilisation of the patient during the first 48 h post-burn
Emergent Phase Assessment

- During the rapid, primary survey, airway and breathing assume top priority. A compromised airway requires prompt attention and breath sounds verified in each lung field.
- If circumferential, full-thickness burns are present on the upper trunk and back, ventilation must be closely monitored as breathing might be impaired and releasing escharotomies necessary (Fig. 8.8).
- Spine must be stabilised until c-spines are cleared.
- Circulation is assessed by examining skin colour, sensation, peripheral pulses and capillary filling. Circumferential, full-thickness burns to the arms or legs must be assessed via palpation or Doppler for evidence of adequate circulation. Escharotomies might be required.
- Typically, burn patients are alert and oriented the first few hours post-burn. If that is not the case, consideration must be given to associated head injury

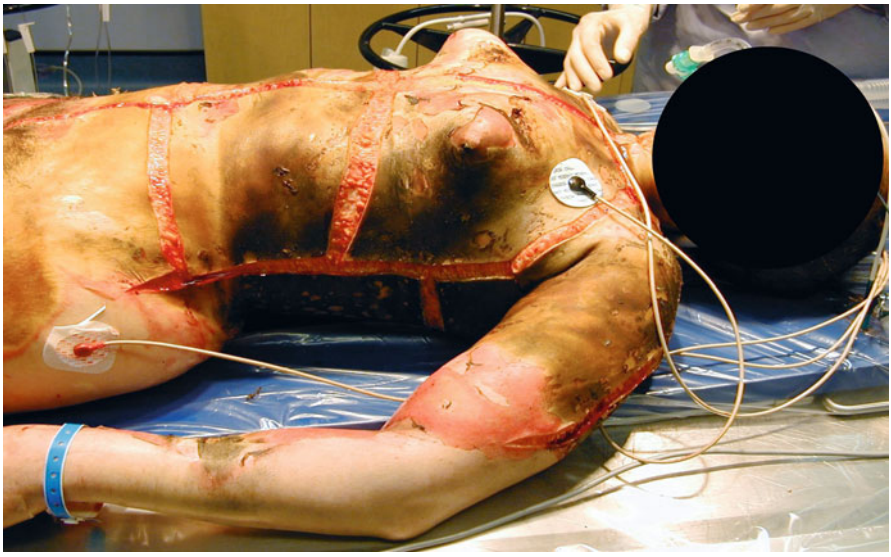

Fig. 8.8 Full-thickness flame burn with releasing escharotomies

(including a complete neurological assessment), substance abuse, hypoxia or pre-existing medical conditions.

- All clothing and jewellery need to be removed in order to visualise the entire body and avoid the "tourniquet-like" effect of constricting items left in place as oedema increases.
- Adherent clothing needs to be gently soaked off with normal saline to avoid further trauma and unnecessary pain.
- Prompt fluid resuscitation must be initiated to address hypovolemic shock.
- Secondary, head-to-toe survey rules out any associated injuries. All medical problems are identified and managed in a timely fashion.
- Circumstances of the injury must be explored to understand the mechanism, duration and severity of the injury.
- Patient's pertinent medical history includes identification of pre-existing disease or associated illness (cardiac or renal disease, diabetes, hypertension), medication/alcohol/drug history, allergies and tetanus immunisation status. A handy mnemonic can be used to remember this information (Box 8.7).

Box 8.7. Secondary Survey Highlights

A	*A*llergies
M	*M*edications
P	*P*revious illness, *p*ast medical history
L	*L*ast meal or drink
E	*E*vents preceding injury

Box 8.8. First Aid Management at the Scene

Steps	Action
Step 1	Stop the burning process – remove patient from heat source
Step 2	Maintain airway – resuscitation measures may be necessary
Step 3	Assess for other injuries and check for any bleeding
Step 4	Flush chemical burns copiously with cool water
Step 5	Flush other burns with cool water to comfort
Step 6	Protect wounds from further trauma
Step 7	Provide emotional support and have someone to remain with patient to explain help is on the way
Step 8	Transport the patient as soon as possible to nearby emergency department

Emergent Phase Management

- The top priority of care is to *stop the burning process* (Box 8.8). During the initial first aid period at the scene, the patient must be removed from the heat source, chemicals should be brushed off and/or flushed from the skin, and the patient wrapped in a clean sheet and blanket ready for transport to the nearest hospital. Careful, local cooling of the burn wound with saline-moistened gauze can continue as long as the patient's core temperature is maintained and he/she does not become hypothermic.
  - Upon arrival at the hospital, the burned areas can be cooled further with normal saline, followed by a complete assessment of the patient and initiation of emergency treatment (Box 8.9). In a burn centre, the cooling may take place, using a cart shower system, in a hydrotherapy room (Fig. 8.9). The temperature of the water is adjusted to the patient's comfort level, but tepid is usually best, while the wounds are quickly cleaned and dressings applied.
- *Airway management* includes administration of 100 % oxygen if burns are 20 % body surface area or greater. Suctioning and ventilatory support may be necessary. If the patient is suspected of having or has an inhalation injury, intubation needs to be performed quickly.
- Evidence-based procedures for the insertion of central lines and care of ventilated patients have resulted in impressive reductions in central line blood stream infection rates and ventilator-acquired pneumonia (VAP) [3].
- *Circulatory management* includes intravenous infusion of fluid to counteract the effects of hypovolemic shock for adult patients with burns >15 % body surface area and children with burns >10 % body surface area. Upon admission, two large bore, intravenous catheters should be inserted, preferably into, but not limited to, unburned tissue.

Box 8.9. Treatment of the Severely Burned Patient on Admission

Steps	Action
Step 1	Stop the burning process
Step 2	Establish and maintain an airway; inspect face and neck for singed nasal hair, soot in the mouth or nose, stridor or hoarseness
Step 3	Administer 100 % high-flow humidified oxygen by non-rebreather mask. Be prepared to intubate if respiratory distress increases
Step 4	Establish intravenous line(s) with large bore cannula(e) and initiate fluid replacement using Lactated Ringer's solution
Step 5	Insert an indwelling urinary catheter
Step 6	Insert a nasogastric tube
Step 7	Monitor vital signs including level of consciousness and oxygen saturation
Step 8	Assess and control pain
Step 9	Gently remove clothing and jewellery
Step 10	Examine and treat other associated injuries
Step 11	Assess extremities for pulses, especially with circumferential burns
Step 12	Determine depth and extent of the burn
Step 13	Provide initial wound care – cool the burn and cover with large, dry gauze dressings
Step 14	Prepare to transport to a burn centre as soon as possible

Fig. 8.9 Cart shower for hydrotherapy

  - Patients who have large burns where intravenous access will be necessary for a number of days benefit from a central venous access device inserted into either the subclavian, jugular or femoral vein. The overall goal is to establish an access route that will accommodate large volumes of fluid for the first 48 h post-burn.
  - The aim of fluid resuscitation is to maintain vital organ function, while avoiding the complications of inadequate or excessive therapy [4]. The most commonly used regimen is the Parkland (Baxter) formula: 4 ml/kg/% body surface area burn using crystalloid (Lactated Ringer's) solution (Box 8.10). *Fluids are calculated for the first 24 h post-burn with "0" hours being the time of the burn,* not *the time of admission to hospital*. One-half of the 24 h total needs to be administered over the first 8 h post-burn, while the remaining half of the estimated resuscitation volume should be administered over the next 16 h.
  - It is important to remember that *the formula is only a guideline*. The infusion needs to be adjusted based on the patient's clinical response, which includes vital signs, sensorium and urinary output. For adults, 30–50 mL urine per hour is the goal and 1 mL/kg/h in children weighing less than 30 kg.
  - An indwelling urinary catheter needs to be inserted at the same time as the IV's are established in order to reliably measure the adequacy of the fluid resuscitation [5].
- *Wound care.* Wound closure will halt or reverse the various fluid/electrolyte, metabolic and infectious processes associated with an open burn wound. The burns are gently cleansed with normal saline, if the care is being provided on a stretcher or bed. If a hydrotherapy cart shower or immersion tank is used, tepid water cleans the wounds of soot and loose debris (Fig. 8.10). Sterile water is not necessary.

Box 8.10. Fluid Resuscitation Using the Parkland (Baxter) Formula

Formula	Administration	Example
4 mL lactated Ringer's solution per kg body weight per % total body surface area (TBSA) burn = total fluid requirements for the first 24 h post-burn (0 h = time of injury)	½ total in first 8 h	For a 65 kg patient with a 40 % burn injured at 1,000 h:
	¼ total in second 8 h	4 mL × 65 kg × 40 % burn = 10,400 mL in first 24 h
	¼ total in third 8 h	½ total in first 8 h (1,000–1,800 h) = 5,200 mL (650 mL/h)
		¼ total in second 8 h (1,800–0,200 h) = 2,600 mL (325 mL/h)
		¼ total in third 8 h (0,200–1,000 h) = 2,600 mL (325 mL/h)

N.B. Remember that the formula is only a guideline. Titrate to maintain urinary output at 30–50 mL/h, stable vital signs and adequate sensorium

Fig. 8.10 Initial wound care post-admission

- Chemical burns should be flushed copiously for at least 20 min, preferably longer.
- Tar cannot be washed off the wound. It requires numerous applications of an emulsifying agent, such as Tween 80®, Medisol® or Polysporin® ointment.
- During hydrotherapy, loose, necrotic tissue (eschar) may be gently removed (debrided) using sterile scissors and forceps. Hair-bearing areas that are burned should be carefully shaved, with the exception of the eyebrows. Showering or bathing should be limited to 20 min in order to minimise patient heat loss and physical/emotional exhaustion.
- More aggressive debridement should be reserved for the operating room, unless the patient receives conscious sedation.
- After the initial bath or shower, further decisions are made regarding wound care. The frequency of the dressing change depends on the condition of the wound and the properties of the dressing employed. All treatment approaches have certain objectives in common (Table 8.6).

Table 8.6 Objectives of burn wound care

Objective	Rationale
Prevention of conversion	Wounds that dry out or develop an infection can become deeper. A partial-thickness wound could then convert to full-thickness and require skin grafting
Removal of devitalized tissue	Debridement, either through dressing changes or surgery, is necessary to clean the wounds and prepare for spontaneous healing or grafting
Preparation of healthy granulation tissue	Healthy tissue, free of eschar and nourished by a good blood supply, is essential for new skin formation
Minimization of systemic infection	Eschar contains many organisms. Removal is essential in order to decrease the bacterial load and reduce the risk of burn wound infection
Completion of the autografting process	Full-thickness wounds require the application of autologous skin grafts from available donor sites
Limitation of scars and contractures	Wounds that heal well the first time tend to have fewer scars and contractures. Some degree of scar and contracture formation are, however, part of the healing process and cannot be entirely prevented

- Wounds are generally treated with a thin layer of topical antimicrobial cream. Topical coverage is selected according to the condition of the wound, desired results and properties of the topical agent (Table 8.7).
- Assessment criteria have been established for choosing the most appropriate agent (Box 8.11).
- The most commonly selected topical antimicrobial agent is silver sulphadiazene, which can be applied directly to saline-moistened gauze, placed on the wound, covered with additional dry gauze or a burn pad and secured with gauze wrap or flexible netting (Fig. 8.11). These dressings are changed once or twice daily.
- Cartilaginous areas, such as the nose and ears, are usually covered with mafenide acetate (Sulfamylon®), which has greater eschar penetration ability.
- Face care includes the application of warmed, saline-moistened gauze to the face for 20 min, followed by a gentle cleansing and reapplication of a thin layer of ointment, such as polymyxin B sulphate (Polysporin®) (Fig. 8.12).
- Silver-impregnated dressings (Acticoat®/Acticoat® Flex, AQUACEL® Ag) are also commonly used in the emergent phase of burn wound care. These dressings are moistened with sterile water, placed on a burn wound and left intact anywhere from 3 to 4 days to as long as 21 days, depending on the patient's individual clinical status and particular product.
- The ideal dressing should possess particular criteria (Box 8.12). During the first few days post-burn, wounds are examined to determine actual depth. It usually takes a few days for deep, partial-thickness wounds to "declare" themselves. Scald injuries are almost always deeper than they appear on admission and need to be closely monitored.

Table 8.7 Topical antimicrobial agents used on burn wounds

Product	Preparation	Antimicrobial action	Applications
Silver sulphadiazene (SSD®, Silvadene®, Flamazine®)	1 % water-soluble cream	Broad-spectrum antimicrobial activity Poor solubility with limited diffusion into eschar	*Burn wound*: applied using the open or closed dressing method of wound care
Mafenide acetate (Sulfamylon®)	8.5 % water-soluble cream	Bacteriostatic for gram-positive and gram-negative organisms. Highly soluble and diffuses through the eschar	*Deep partial-thickness and full-thickness burns*: applied using either the open (exposure) or closed (occlusive) dressing method
	5 % solution	Same as above	*Graft site*: saturated dressings are applied
Silver nitrate	0.5 % solution	Broad-spectrum antimicrobial activity Hypotonic solution	*Burn wound or graft site*: Saturated, multilayered dressings are applied to the wound or grafted surface
Petroleum and mineral oil-based antimicrobial ointments (e.g. Neosporin®, Bacitracin®, Polysporin®)	Neosporin® (neomycin, bacitracin, polymyxin B), Bacitracin® (bacitracin zinc), Polysporin® (bacitracin, polymyxin B)	Bactericidal for a variety of gram-positive and gram-negative organisms. Ointments have limited ability to penetrate eschar	*Superficial burn wound*: applied to wound in a thin (1 mm) layer and should be reapplied as needed to keep ointment in contact with wound

Box 8.11. Properties of Topical Antimicrobial Agents
- Readily available
- Pharmacologic stability
- Sensitivity to specific organisms
- Non-toxic
- Cost-effective
- Non-painful on application
- Capability of eschar penetration

Fig. 8.11 Applying silver sulphadiazene cream to saline-moistened gauze

- Whatever topical and dressing strategies are chosen, basic aseptic wound management techniques must be followed [6]. Personnel need to wear isolation gowns over scrub suits, masks, head covers and clean, disposable gloves to remove soiled dressings or cleanse wounds. Sterile gloves should be used when applying inner dressings or ointment to the face.

Acute Phase Priorities: closure of the burn wound, management of any complications
Acute Phase Goals of Care: spontaneous diuresis, ongoing fluid management, wound closure, detection and treatment of complications over a period of a week to many months, optimal pain management and nutrition

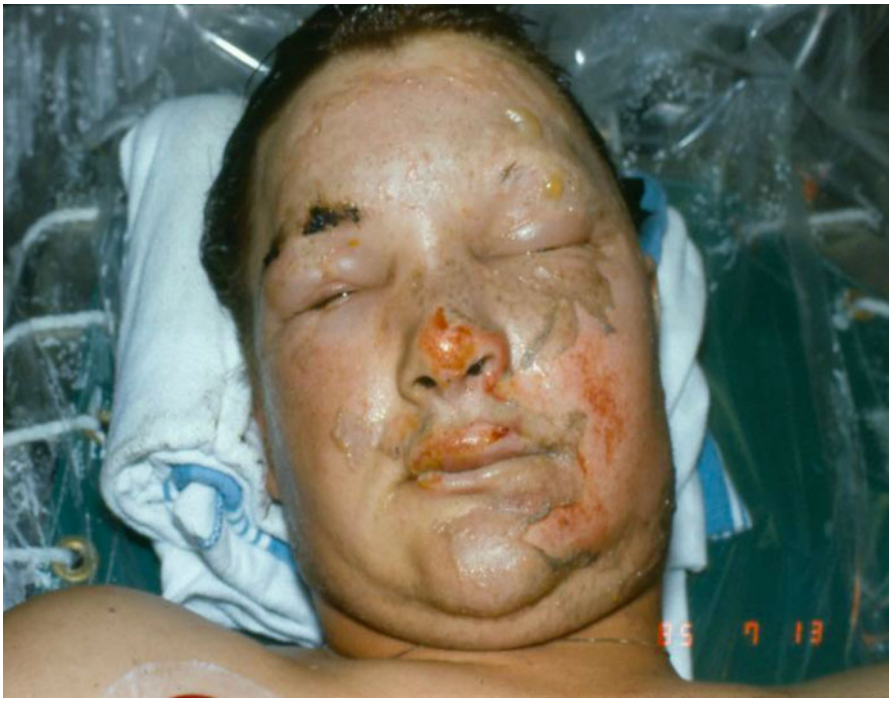

Fig. 8.12 Facial burn wound care

Box 8.12. Criteria for Burn Wound Coverings

- Absence of antigenicity
- Tissue compatibility
- Absence of local and systemic toxicity
- Water vapour transmission similar to normal skin
- Impermeability to exogenous microorganisms
- Rapid and sustained adherence to wound surface
- Inner surface structure that permits ingrowth of fibrovascular tissue
- Flexibility and pliability to permit conformation to irregular wound surface, elasticity to permit motion of underlying body tissue
- Resistance to linear and shear stresses
- Prevention of proliferation of wound surface flora and reduction of bacterial density of the wound
- Tensile strength to resist fragmentation and retention of membrane fragments when removed
- Biodegradability (important for "permanently" implanted membranes)
- Low cost
- Indefinite shelf life
- Minimal storage requirements and easy delivery

Acute Phase Assessment

- Fluid therapy is administered in accordance with the patient's fluid losses and medication administration.
- Wounds are examined on a daily basis, and adjustments are made to the dressings applied. If a wound is full-thickness, arrangements need to be made to take the patient to the operating room for surgical excision and grafting.
- Pain and anxiety levels need to be measured and responded to on a daily basis. A variety of pharmacologic strategies are available (Table 8.8) and address both the background discomfort from burn injury itself and the pain inflicted during procedural and rehabilitative activities.
- Calorie needs are assessed on a daily basis and nutrition adjusted accordingly.

Acute Phase Management

- Wound care is performed daily and treatments adjusted according to the changing condition of the wounds (Table 8.9). Selecting the most appropriate method to close the burn wound is by far the most important task in the acute period. During the dressing changes, nurses debride small amounts of loose tissue for a short period of time, ensuring that the patient receives adequate analgesia and sedation. As the devitalized burn tissue (eschar) is removed from the areas of partial-thickness burn, the type of dressing selected is based on its ability to promote moist wound healing. There are biologic, biosynthetic and synthetic dressings and skin substitutes available today (Table 8.10). Areas of full-thickness damage require surgical excision and skin grafting. There are specific dressings appropriate for grafted areas and donor sites.
- Ongoing rehabilitation, offered through physiotherapy and occupational therapy, is an important part of a patient's daily plan of care. Depending on the patient's particular needs and stage of recovery, there are certain range-of-motion exercises, ambulation activities, chest physiotherapy, stretching and splinting routines to follow. The programme is adjusted on a daily/weekly basis as the patient makes progress towards particular goals and as his/her clinical condition improves or worsens.

Rehabilitative Phase Priorities: maintaining wound closure, scar management, rebuilding strength, transitioning to a rehabilitation facility and/or home

Rehabilitative Phase Goal of Care: returning the burn survivor to a state of optimal physical and psychosocial functioning

Rehabilitation Phase Assessment

- The clinical focus in on ensuring all open wounds eventually close, observing and responding to the development of scars and contractures and ensuring that there is a plan for future reconstructive surgical care if the need exists.

Rehabilitation Phase Management

- Wound care is generally fairly simple at this time. Dressings should be minimal or non-existent. The healed skin is still quite fragile and can break down with very little provocation. The need to moisturise the skin with water-based creams is emphasised in order to keep the skin supple and to decrease the itchiness that may be present.

Table 8.8 Sample burn pain management protocol

Recovery phase	Treatment	Considerations
Critical/acute with mild to moderate pain experience	IV Morphine Continuous infusion, i.e. 2–4 mg q 1 h Bolus for breakthrough, i.e. 1/3 continuous infusion hourly dose Bolus for acutely painful episodes/mobilisation, i.e. 3× continuous infusion hourly dose; consider hydromorphone or fentanyl if morphine ineffective	Assess patient's level of pain q 1 h using VAS (0–10) Assess patient's response to medication and adjust as necessary Assess need for antianxiety agents, i.e. Ativan®, Versed® Relaxation exercises Music distraction
Critical/acute with severe pain experience	1. IV Morphine Continuous infusion for background pain, i.e. 2–4 mg q 1 h Bolus for breakthrough 2. IV Fentanyl Bolus for painful dressing changes/mobilisation 3. IV Versed® Bolus for extremely painful dressing change/mobilisation 4. Propofol Infusion Consult with Department of Anaesthesia for prolonged and extremely painful procedures, i.e. major staple/dressing removal	Consider fentanyl infusion for short-term management of severe pain Assess level of pain q1h using VAS Assess level of sedation using SASS score Relaxation exercises Music distraction Assess need for antianxiety/sedation agents, i.e. Ativan®, Versed®
Later acute/rehab with mild to moderate pain experience	Oral continuous release morphine or hydromorphone – for background pain BID Oral morphine or hydromorphone for breakthrough pain and dressing change/mobilisation Consider adjuvant analgesics such as gabapentin, ketoprofen, ibuprofen, acetaminophen	Assess level of pain q1h using VAS Consult equianalgesic table for conversion from IV to PO Assess for pruritus

Table 8.9 Sample burn wound management protocol

Wound status	Treatment	Considerations
Early acute, partial or full thickness, eschar/blisters present	Silver sulphadiazene-impregnated gauze	Apply thin layer (2–3 mm) of silver sulphadiazene to avoid excessive build-up
	Saline-moistened gauze	Monitor for local signs of infection, i.e. purulent drainage and odour, and notify M.D. re. potential need for alternative topical agents, i.e. acetic acid and mafenide acetate
	Dry gauze – outer wrap	
	Mafenide acetate (Sulfamylon®) to cartilaginous areas of face, i.e. nose, ears	
	Polymyxin B sulphate (Polysporin®) to face	
	Change BID to body, face care q4h	
Mid-acute, partial or full thickness, leathery or cheesy eschar remaining	Saline-moistened gauze	Saline dressings to be applied to a relatively small area due to potentially painful nature of treatment
	Dry gauze – outer wrap	Potential use of enzymatic debriding agents (Collagenase Santyl®, Elase®, Accuzyme®)
	Change BID	Monitor for local signs of infection and notify MD
	Full-thickness wounds to be excised surgically	
Late acute, clean partial-thickness wound bed	Non-adherent greasy gauze dressing (Jelonet®, Adaptic®)	Monitor for local signs of infection and notify MD
	Saline-moistened gauze	
	Dry gauze – outer wrap	
	Change once daily	
Post-op graft site	Non-adherent greasy gauze dressing (Jelonet®, Adaptic®)	Select appropriate pressure-relieving sleep surface
	Saline-moistened gauze	Monitor for local signs of infection and notify MD
	Dry gauze – outer wrap	
	Leave intact ×2 days	
	Post-op day 2, gently debulk to non-adherent gauze layer → redress once daily	
	Post-op day 5, gently debulk to grafted area	
	Redress once daily	

Early rehab, healed partial-thickness or graft site	Polymyxin B sulphate (Polysporin®) until wound stable BID When stable, moisturising cream applied BID and prn	Apply thin layer (2 mm) of Polysporin® to avoid excessive build-up Avoid lanolin and mineral-oil containing creams which clog epidermal pores and do not reach dry, dermal layer
Post-op donor site	Hydrophilic foam dressing (i.e. Allevyn®/Mepilex®) or medicated greasy gauze dressing (i.e. Xeroform®) Cover foam with transparent film dressing and pressure wrap ×24 h Remove wrap and leave dressing intact until day 4; replace on day 4 and leave intact until day 8. Remove and inspect If wound unhealed, reapply a second foam dressing If healed, apply polymyxin B sulphate (Polysporin®) BID When stable, apply moisturising cream BID and prn Cover Xeroform® with dry gauze and secure. Leave intact for 5 days Remove outer gauze on day 5 and leave open to air. Apply light layer of polymyxin B sulphate (Polysporin®) ointment. If moist, reapply gauze dressing for 2–3 more days When Xeroform® dressing lifts up as donor site heals, trim excess and apply polymyxin B sulphate (Polysporin®) ointment	Monitor for local signs of infection and notify MD
Face	Normal saline-moistened gauze soaks applied to face x15 min Remove debris gently using gauze Apply thin layer of polymyxin B sulphate (Polysporin®) Repeat soaks q 4–6 h Apply light layer of mafenide acetate (Sulfamylon®) cream to burned ears and nose cartilage	For male patients, carefully shave beard area on admission and as necessary to avoid build-up of debris. Scalp hair may also need to be clipped carefully on admission to inspect for any burn wounds

Table 8.10 Temporary and permanent skin substitutes

Biological	Biosynthetic	Synthetic
Temporary Allograft/homograft (cadaver skin) Clean, partial- and full-thickness burns Amniotic membrane Clean, partial-thickness burns Xenograft (pigskin) Clean partial- and full-thickness burns	Temporary Nylon polymer bonded to silicone membrane with collagenous porcine peptides (BioBrane®) Clean, partial-thickness burns, donor sites Calcium alginate from brown seaweed (Curasorb®, Kalginate®) Exudative wounds, donor sites Human dermal fibroblasts cultured onto BioBrane® (TransCyte®) Clean, partial-thickness burns Mesh matrix of oat beta-glucan and collagen attached to gas-permeable polymer (BGC Matrix®) Clean, partial-thickness burns, donor sites	Temporary Polyurethane and polyethylene thin film (OpSite®, Tegaderm®, Omiderm®, Bioclusive®) Composite polymeric foam (Allevyn®, Mepilex®, Curafoam®, Lyofoam®) Clean, partial-thickness burns, donor sites Non-adherent gauze (Jelonet®, Xeroform®, Adaptic®) Clean partial-thickness burns, skin grafts, donor sites
Semi-permanent Mixed allograft seeded onto widely meshed autograft Clean, full-thickness burns	Semi-permanent Bilaminar membrane of bovine collagen and glycosaminoglycan attached to Silastic layer (Integra®) Clean, full-thickness burns	
Permanent Cultured epithelial autografts (CEA) grown from patient's own keratinocytes (Epicel®) Clean, full-thickness burns Allograft dermis decellularized, freeze-dried and covered with thin autograft or cultured keratinocytes (AlloDerm®) Clean, full-thickness burns		

- Visits to outpatient burn clinic provide opportunities for ongoing contact between staff, patients and family post-discharge, wound evaluation and assessment of physical and psychological recovery.
- Scar maturation begins and contractures may worsen. Scar management techniques, including pressure garments, inserts, massage and stretching exercises, need to be taught to patients, and their importance reinforced with each and every visit.
- Encouragement is also essential in order to keep patients and families motivated, particularly during the times when progress is slow and there seems to be no end in sight to the months of therapy.
- The burn surgeon can also plan future reconstructive surgeries for the patient, taking into consideration what improvements the burn patient wishes to see first.

8.5.2 Surgical Care

- Full-thickness burn wounds do not have sufficient numbers of skin-reproducing cells in the dermis to satisfactorily heal on their own. Surgical closure is needed.
- Common practice in surgical burn management is to begin surgically removing (excising) full-thickness burn wounds within a week of admission. Most patients undergo excision of non-viable tissue (Fig. 8.13) and grafting in the same operative procedure. In some instances, if there is concern the wound bed may not be

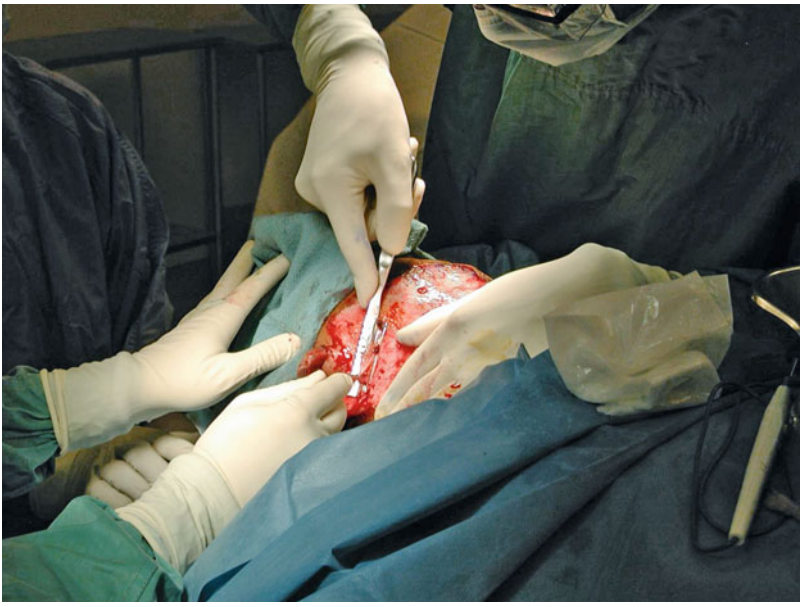

Fig. 8.13 Surgical excision of full-thickness burn wound

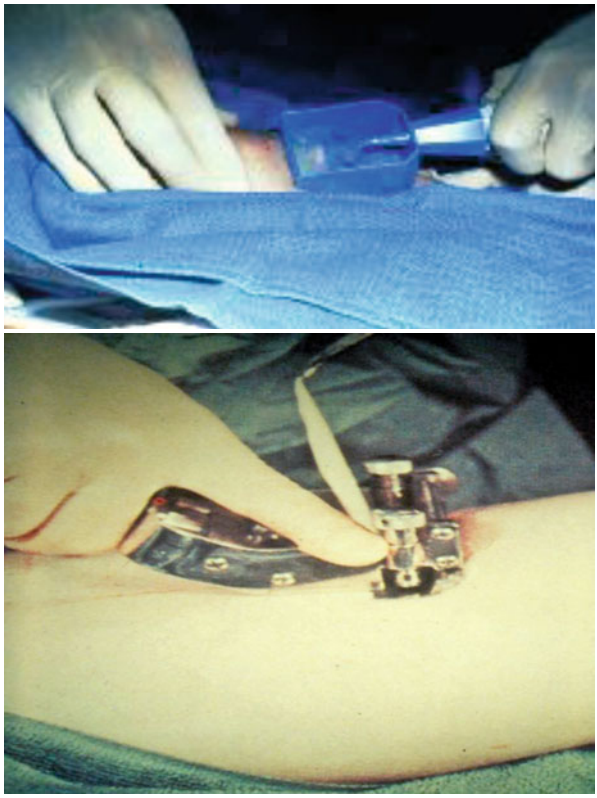

Fig. 8.14 Harvesting a split-thickness skin graft. Adrenalin/saline soaks may be applied to donor sites to control bleeding before the donor dressing is applied. Tumescence. Electrocautery may also be used

ready for a graft, the wounds are excised and covered with topical antimicrobials, followed by a temporary biologic or synthetic dressing.

- Patient preparation preoperatively includes educational and psychological support to ensure an optimal recovery period postoperatively.
- The donor skin (skin graft), which is harvested in this first O.R., using a dermatome (Fig. 8.14), is then wrapped up in sterile fashion and placed in a skin fridge for later application. Allograft (cadaver skin) may be laid down temporarily.
- Two days later, the patient returns to the OR to have the excised wounds (recipient bed) examined and the donor skin laid as a skin graft on the clean recipient bed. Dressings remain intact for 5 days postoperatively.
- Concern over blood loss and lack of sufficient donor sites are the two limiting factors when attempting to excise and graft patients with extensive wounds.
- Grafts can be split-thickness or full-thickness in depth, meshed or unmeshed in appearance and temporary or permanent in nature (Table 8.11).
- Grafts should be left as unmeshed sheets for application to highly visible areas, such as the face, neck or back of the hand (Fig. 8.15).

Table 8.11 Sources of skin grafts

Type	Source	Coverage
Autograft	Patient's own skin	Permanent
Isograft	Identical twin's skin	Permanent
Allograft/homograft	Cadaver skin	Temporary
Xenograft/heterograft	Pigskin, amnion	Temporary

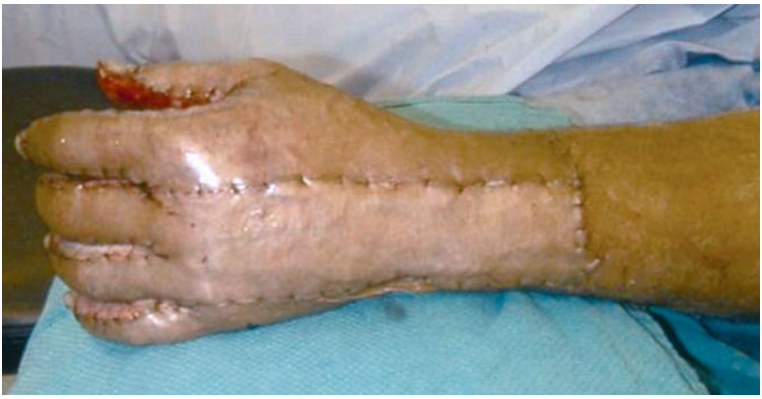

Fig. 8.15 Unmeshed split-thickness sheet graft

- Sheet grafts are generally left open and frequently observed by nursing and medical staff for evidence of serosanguinous exudate under the skin.
- On other parts of the body, grafts can be meshed using a dermatome mesher (Fig. 8.16). The mesher is set to an expansion ratio chosen by the surgeon. An expansion ratio of 1.5:1 allows for exudate to come through and be wicked into a protective dressing, while at the same time be cosmetically acceptable (Fig. 8.17). Wider expansion ratios (3:1, 6:1) allow for increased coverage when there are limited donor sites.
- Meshed skin grafts are generally covered with one of a number of possible options, including silver-impregnated, vacuum-assisted closure, greasy gauze or cotton gauze dressings. Most are left intact for 5 days to allow for good vascularisation between the recipient bed and the skin graft.
- Following the initial "take down" at post-op day 5, the dressings are changed every day until the graft has become adherent and stable, usually around day 8.
- For the next year or so post-burn, the skin grafts mature and their appearance improves (Fig. 8.18). Patients are cautioned that the skin graft appearance will "mature" over the next year and not to be overly concerned about the postoperative appearance.
- The donor site can be dressed with either a transparent occlusive, hydrophilic foam or greasy gauze dressing (Fig. 8.19). Donor sites generally heal in 10–14 days and can be reharvested, if necessary, at subsequent operative procedures (Fig. 8.20). Patients are provided with adequate pain management and support as donor sites are very painful.

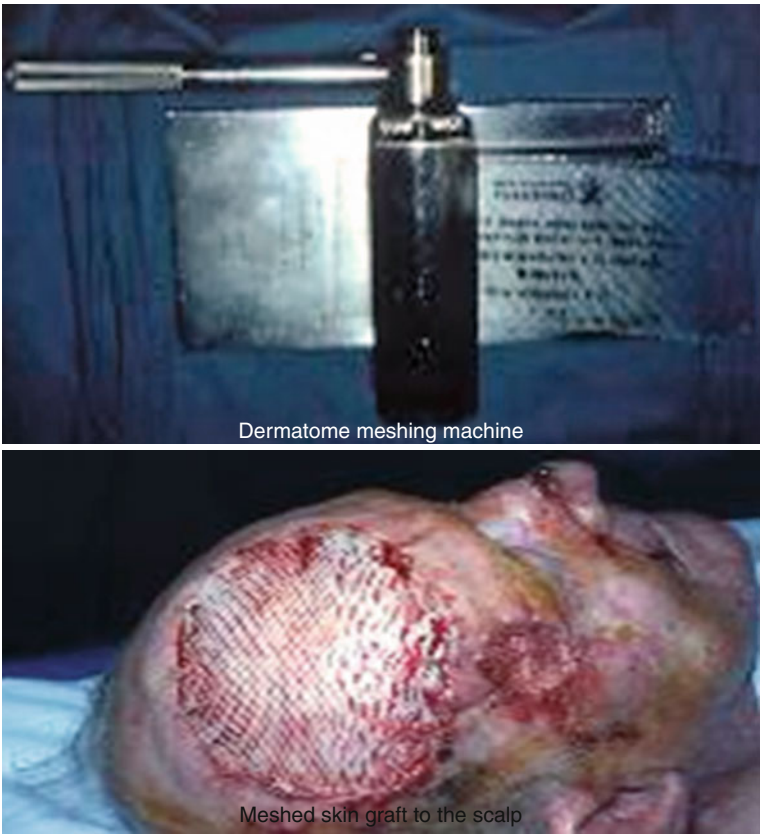

Fig. 8.16 Putting a skin graft through a dermatome mesher. Once harvested, graft is placed on a plastic dermatome carrier and run through a meshing machine. Mesh ratio pattern from 1.5:1 (most common) to 12:1. If donor sites are few and area to cover is large, meshing ratio will increase to 3:1 or 6:1. Exudate can come up through the holes in the mesh pattern to be wicked into the intact dressing. Grafts to the face and hands are not meshed for optimal cosmetic results. These sheet grafts are nursed open

- Over the past 10 years, there have been major advancements in the development, manufacture and clinical application of a number of temporary and permanent biologic skin substitutes. Most of these products were initially developed in response to the problems faced when grafting the massive (i.e. >70 %) burn wound where donor sites are limited (Table 8.12). The search for a permanent skin substitute continues.

8.5.3 Pharmacological Support

Burn patients are assessed for:

- Tetanus toxoid, because of the risk of anaerobic burn wound contamination. Tetanus immunoglobulin is given to those patients who have not been actively immunised within the previous 10 years.

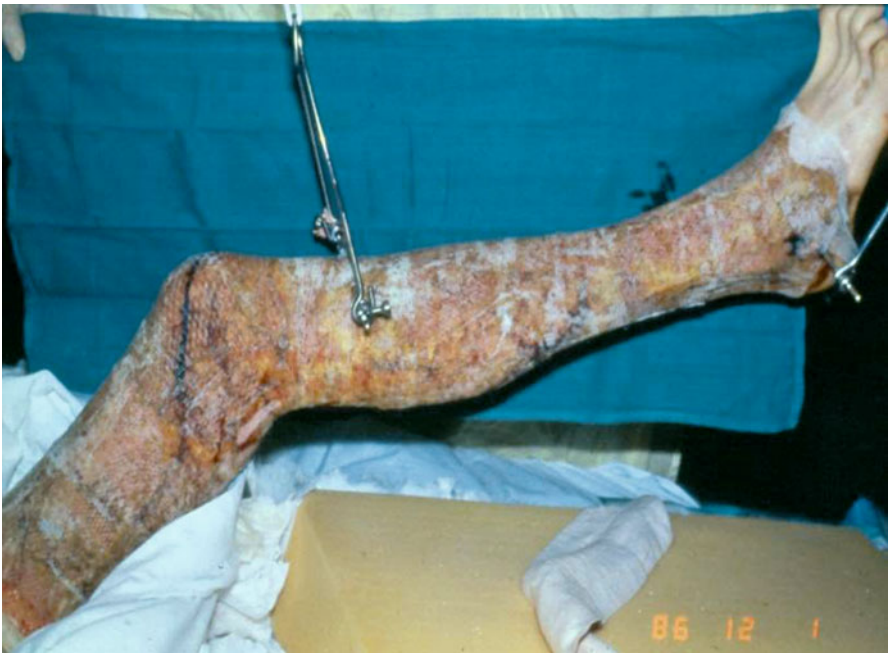

Fig. 8.17 Meshed split-thickness skin graft

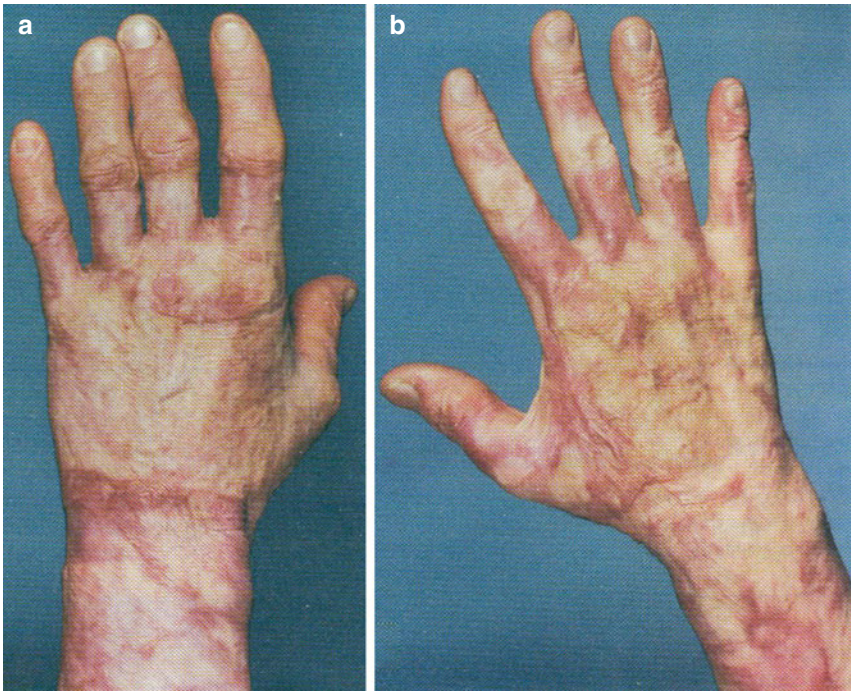

Fig. 8.18 (**a**, **b**) Mature split-thickness skin graft

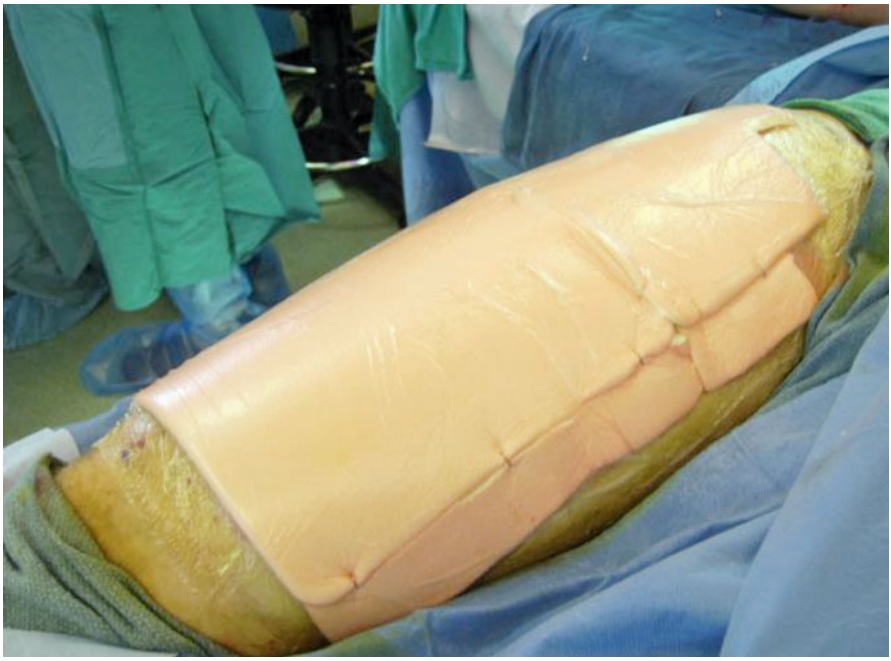

Fig. 8.19 Harvested donor site

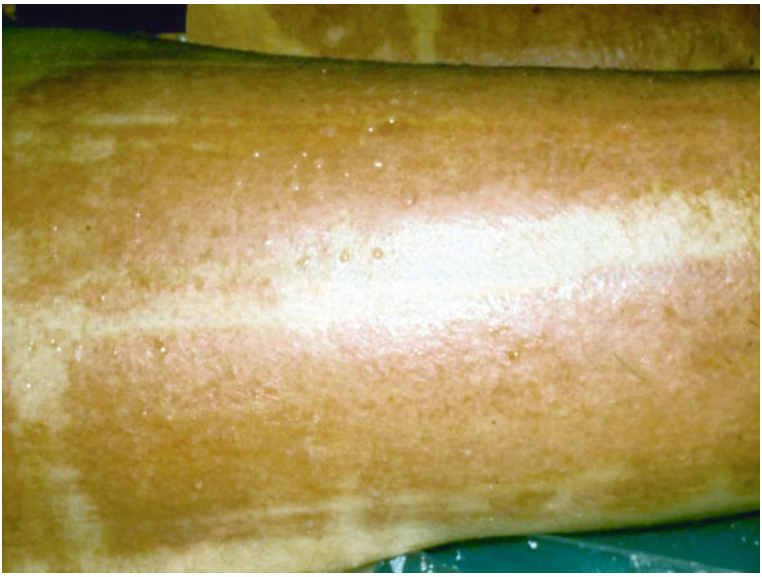

Fig. 8.20 Healed donor site

Table 8.12 Biologic skin replacements

Source	Product	Description
Cultured epithelial autograft (CEA)	Epicel® (Genzyme Corporation, Massachusetts)	Cultured, autologous keratinocytes grown from patient's donated skin cells 6–8 cells thick, 2–3 weeks culture time Lacks dermal component; susceptible to infection Lacks epidermal cell-to-connective tissue attachment and is, therefore, very fragile
Dermal replacement	Integra® (Johnson & Johnson, Texas)	Synthetic, dermal substitute Neodermis formed by fibrovascular ingrowth of wound bed into 2 mm thick glycosaminoglycan matrix dermal analogue Epidermal component, Silastic, removed in 2–3 weeks and replaced with ultrathin autograft Functional burn wound cover Requires 2 O.R.'s : 1 for dermal placement, 1 for epidermal graft
Dermal replacement	AlloDerm® (LifeCell Corporation, Texas)	Cadaver allograft dermis rendered acellular and nonimmunogenic Covered with autograft in same O.R. procedure

Table 8.13 Anxiolytics commonly used in burn care

Generalised anxiety	Situational anxiety (dressing changes, major procedures)	Delirium
Lorazepam (Ativan®) IV	Midazolam (Versed®) IV	Haloperidol (Haldol®) IV
Works nicely in combination with analgesics for routine dressing changes and care	Works nicely in combination with analgesics when very painful and prolonged procedures are performed	Works nicely for patients who appear agitated or disoriented

- Pain medication, which should always be administered intravenously during the hypovolemic shock phase as gastrointestinal function is impaired and intramuscular (IM) medications would not be absorbed adequately.
  - The medication of choice for moderate to severe pain management is an opioid, such as morphine or hydromorphone, as they can be given intravenously and orally and are available in fast-acting and slow-release forms (Table 8.8).
  - As the burn wounds close and the patient's pain level increases, reductions in analgesic therapy should occur by careful taper, rather than abrupt discontinuation, of opioids.
- Sedative agents (Table 8.13).
- Non-pharmacologic approaches to pain management (hypnosis, relaxation, imagery).
- Topical antimicrobial therapy for burn wound care (Table 8.7).

Table 8.14 Medications commonly used in burn care

Types and names	Rationale
Gastrointestinal care	
Ranitidine (Zantac®)	Decreases incidence of stress (Curling's) ulcers
Nystatin (Mycostatin®)	Prevents overgrowth of *Candida albicans* in oral mucosa
Milk of magnesia, lactulose, docusate sodium, sennosides, glycerin or bisacodyl suppository	Prevents/corrects opioid-induced constipation
Nutritional care	
Vitamins A, C, E and multivitamins	Promotes wound healing, immune function, haemoglobin formation and cellular integrity
Minerals: selenium, zinc sulphate, iron (ferrous gluconate and sulphate), folic acid, thiamine	

  - The most widely used broad-spectrum antimicrobial agent is silver sulphadiazene. Local application on the burn wound is necessary, as systemic antibiotics would not be able to reach the avascular burn wound.
  - Mafenide acetate is indicated for burned ears and noses as it has a greater ability to penetrate through cartilage.
- Systemic antibiotics when a burn wound infection has been clinically diagnosed or other indicators of sepsis are present, such as pneumonia or uncontrolled fever.
- Additional medications to manage gastrointestinal complications treat antibiotic-induced superinfections and boost the patient's metabolic and nutritional status (Table 8.14).

8.5.4 Psychosocial Support

Psychosocial support to burn survivors and their family members is an essential part of their ongoing care. Concern for family provides them with necessary comfort so they, in turn, can be the patient's single most important social support.

The social worker in a burn centre can provide ongoing counselling and emotional support to patients and family members. Assistance in coping with difficult or stressful matters, such as financial concerns, finding accommodation, questions about hospital insurance coverage or ongoing problems at work or home, is also available. Chaplains offer spiritual support during times of crisis and at various points along the road to recovery. For some, the burn injury is a tremendous test of spiritual faith and brings forward troubling questions for which there are no easy answers, such as "Why did this happen to me and to my family?" Coming to terms with this traumatic event allows the burn survivor to move forward in a positive way.

Some burn patients were troubled psychologically pre-burn. They may have formal psychiatric diagnoses and/or histories of drug and/or alcohol abuse. For others, the psychological trauma begins with the burn injury. Referral to a psychiatrist or psychologist for supportive psychotherapy and/or medication can make a positive

difference in those situations. It is important, however, before such referrals are made, to discuss the situation with the patient (if he/she is considered mentally competent). This disclosure provides the team with an opportunity to share their interpretation of the patient's behaviours and to listen to how the patient views his/her coping abilities and behaviours. The burn patient and his family need to feel supported and not stigmatised by the recommendation to seek psychological support.

In recent years, the role of patient and family support groups has been examined and encouraged by burn team members. The power of the lived experience is profound. The advice and caring that comes from one who truly knows what it is like to survive a burn injury or the family member of one who has been burned is valuable beyond measure [7–9]. Many burn centres are fortunate to have a burn survivor support group affiliated with them. Based in the USA, but with members from around the world, the Phoenix Society has hundreds of area coordinators and volunteers, through the SOAR (Survivors Offering Assistance in Recovery), who meet with burn survivors in their communities and help; however, they can visit http://www.phoenix-society.org or email info@phoenix-society.org or call 1-800-888-2876 (BURN).

School re-entry programmes and burn camps are also widely available through most paediatric burn centres. Additional information can be obtained from the Phoenix Society or from your provincial/state burn unit/centre.

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